

WHAT IS CLAIMED IS:

1. A method for producing an aluminum nitride/aluminum base composite material comprising the steps of;

(A) charging aluminum nitride powder into a container provided in a molten metal pressure apparatus,

(B) applying pressure to the aluminum nitride powder in the container,

(C) pouring a molten aluminum base material into the container, and,

(D) applying pressure to the molten aluminum base material in the container to fill the aluminum base material in space between the aluminum nitride powder particles.

2. The method according to claim 1, in where the molten aluminum base material together with silicon is poured into the container.

3. A method for producing an aluminum nitride/aluminum base composite material comprising the steps of;

(a) charging aluminum nitride powder into a container provided in a molten metal pressure apparatus, applying pressure to the aluminum nitride powder in the container, pouring a molten aluminum base material into the container, and, then, applying pressure to the molten aluminum base material in the container to fill the aluminum base material in space between the aluminum nitride powder particles, thereby obtaining a base material, and

(b) covering the surface of the base material with a covering layer consisting of a ceramic material.

4. The method according to claim 3, in where the molten aluminum base material being together with

silicon is poured into the container in the step (a).

5. The method according to claim 3, in which the relation of $(\alpha_1 - 4) \leq \alpha_2 \leq (\alpha_1 + 4)$ is satisfied, where α_1 represents a linear expansion coefficient of the base material [unit: $10^{-6}/K$] and α_2 represents a linear expansion coefficient of the ceramic material constituting the covering layer [unit: $10^{-6}/K$].

6. The method according to claim 3, in which the ceramic material constituting the covering layer is Al_2O_3 or aluminum nitride.

7. A method for producing an aluminum nitride/aluminum base composite material comprising the steps of;

(A) preparing a preform obtained by sintering aluminum nitride powder,

(B) enclosing the preform in a container provided in a molten metal pressure apparatus,

(C) pouring a molten aluminum base material into the container, and,

(D) applying pressure to the molten aluminum base material in the container to fill the aluminum base material in pores of the preform.

8. The method according to claim 7, in which the molten aluminum base material being together with silicon is poured into the container.

9. A method for producing an aluminum nitride/aluminum base composite material comprising the steps of;

(a) preparing a preform obtained by sintering aluminum nitride powder, enclosing the preform in a container provided in a molten metal pressure apparatus, pouring a molten aluminum base material into the

container, and, then, applying pressure to the molten aluminum base material in the container to fill the aluminum base material in pores of the preform, thereby obtaining a base material, and

(b) covering the surface of the base material with a covering layer consisting of a ceramic material.

10. The method according to claim 9, in which the molten aluminum base material being together with silicon is poured into the container in the step (a).

11. The method according to claim 9, in which the relation of $(\alpha_1 - 4) \leq \alpha_2 \leq (\alpha_1 + 4)$ is satisfied, where α_1 represents a linear expansion coefficient of the base material [unit: $10^{-6}/K$] and α_2 represents a linear expansion coefficient of the ceramic material constituting the covering layer [unit: $10^{-6}/K$].

12. The method according to claim 9, in which the ceramic material constituting the covering layer is Al_2O_3 or aluminum nitride.

13. An aluminum nitride/aluminum base composite material produced by the steps of;

(A) charging aluminum nitride powder into a container provided in a molten metal pressure apparatus,

(B) applying pressure to the aluminum nitride powder in the container,

(C) pouring a molten aluminum base material into the container, and,

(D) applying pressure to the molten aluminum base material in the container to fill the aluminum base material in space between the aluminum nitride powder particles.

14. The aluminum nitride/aluminum base composite material according to claim 13, in which the molten

aluminum base material being together with silicon is poured into the container.

15. An aluminum nitride/aluminum base composite material comprises;

(a) a base material obtained by charging aluminum nitride powder into a container provided in a molten metal pressure apparatus, applying pressure to the aluminum nitride powder in the container, pouring a molten aluminum base material into the container, and, then, applying pressure to the molten aluminum base material in the container to fill the aluminum base material in space between the aluminum nitride powder particles, and

(b) a covering layer consisting of a ceramic material and covering the surface of the base material.

16. The aluminum nitride/aluminum base composite material according to claim 15, in which the molten aluminum base material being together with silicon is poured into the container.

17. The aluminum nitride/aluminum base composite material according to claim 15, in which the relation of $(\alpha_1 - 4) \leq \alpha_2 \leq (\alpha_1 + 4)$ is satisfied, where α_1 represents a linear expansion coefficient of the base material [unit: $10^{-6}/K$] and α_2 represents a linear expansion coefficient of the ceramic material constituting the covering layer [unit: $10^{-6}/K$].

18. The aluminum nitride/aluminum base composite material according to claim 15, in which the ceramic material constituting the covering layer is Al_2O_3 or aluminum nitride.

19. An aluminum nitride/aluminum base composite material produced by the steps of;

- (A) preparing a preform obtained by sintering aluminum nitride powder,
- (B) enclosing the preform in a container provided in a molten metal pressure apparatus,
- (C) pouring a molten aluminum base material into the container, and,
- (D) applying pressure to the molten aluminum base material in the container to fill the aluminum base material in pores of the preform.

20. The aluminum nitride/aluminum base composite material according to claim 19, in which the molten aluminum base material being together with silicon is poured into the container.

21. An aluminum nitride/aluminum base composite material comprises;

(a) a base material obtained by preparing a preform obtained by sintering aluminum nitride powder, enclosing the preform in a container provided in a molten metal pressure apparatus, pouring a molten aluminum base material into the container, and, applying pressure to the molten aluminum base material in the container to fill the aluminum base material in pores of the preform, and

(b) a covering layer consisting of a ceramic material and covering the surface of the base material.

22. The aluminum nitride/aluminum base composite material according to claim 21, in which the molten aluminum base material being together with silicon is poured into the container.

23. The aluminum nitride/aluminum base composite material according to claim 21, in which the relation of $(\alpha_1 - 4) \leq \alpha_2 \leq (\alpha_1 + 4)$ is satisfied, where α_1 represents a linear expansion coefficient of the base material

[unit: $10^{-6}/K$] and α_2 represents a linear expansion coefficient of the ceramic material constituting the covering layer [unit: $10^{-6}/K$].

24. The aluminum nitride/aluminum base composite material according to claim 21, in which the ceramic material constituting the covering layer is Al_2O_3 or aluminum nitride.

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